Ecosystem-Adaptive Management

Adaptive Management for ecosystems with limited knowledge, under changing conditions (1970's, re-invented 2000).

- Recognition that traditional single variable management worked, but multiple variables under changing conditions didn't
- Shift with new science and philosophy
- New management tools (GIS, impact measures, continuous monitoring equipment)

Adaptive Management 2009

All management should be adaptive, but isn't always Adaptive Management-

- High degree of uncertainty (or risk)
- Complexity requires multidisciplinary approach
- Testable hypotheses (and statistics)
- Monitoring implementation, annual/periodic effectiveness, and re-examining hypotheses
- Management tools (measuring *and* control)
- Feedback loop from learning

Delta Mercury Adaptive Management

Who is on the team?

Which stakeholders? Do you have the managers of the resources that control the sources? Do you have the scientists that can ensure effective monitoring, understand the relevant ecology, *and* the management?

Don’t stop the process until everything is perfect, but make sure that it is as good as you can make.

Adaptive Management

Continuous monitoring informs management using defined scientific questions, learning from analysis, iteratively.

Goals- understand and manage mercury (methylation/bioavailability), fish, food web, and cycling variables.

Objectives- monitor critical variables, test sensitivity of critical variables, adjust management to minimize critical variables, while assessing new information and biological responses.

Adaptive Roadmap TMDL

Example: Define areas of uncertainty and next steps and areas of agreement

- Identify baseline outfall, stream, and fish conditions
- Hypothesis: BMPs will remove 15% of attached total Hg
- Results:? Test and redefine hypothesis

TMDL BPA and Attachment A Phased Approach:

Conduct studies to evaluate MeHg and THg sources, evaluate BMPs for technical, economic, and environmental feasibility.

Phase I. studies drive the Phase II. process.

BPA recommends comprehensive multi-variate approach, phases could be broadened to adaptive management.

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Take Home Messages

Adaptive Management, is it the right tool for the problem(s)?

Process is only as good as the people involved, their authority; and, as effective as the goals and objectives.

Scientists are just one member of a team in a a political and legal process, but a critical member.

The feedback loop is critical, otherwise it is not adaptive.